(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 530 160 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92850168.3**

(51) Int. Cl.^{5} : **A61C 8/00**

(22) Date of filing : **07.07.92**

(30) Priority : **27.08.91 SE 9102451**

(43) Date of publication of application :
03.03.93 Bulletin 93/09

(84) Designated Contracting States :
AT BE CH DE DK ES FR GB GR IT LI NL SE

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(54) Anchoring member.

(57) The present invention relates to a screw-shaped titanium anchoring member for permanent anchorage in bone tissue, specifically permanent anchorage of artificial teeth or tooth bridges in the jaw-bone. The tip of the anchoring member comprises at least one cavity (4). The edges of the cavities on the outer cylindrical surface are forming cutting edges (5) to provide self-tapping when the anchoring member is screwed into the bone tissue. The total volume of the cavities is adapted to contain the scraped-off bone tissue material, i.e. all the scraped-off bone tissue material can be housed in the screw in the volume formed by the cavities. Behind the cutting edges (5) the anchoring member has a clearance surface (9), i.e. behind each cutting edge the surface of the anchoring member is slightly bevelled towards the center of the anchoring member. By means of such clearance surface any squeezing effect which might occur in the cutting portion of the fixture when it is screwed into hard bone tissue can be avoided.

EP 0 530 160 A1

The present invention relates to a screw-shaped anchoring member made of titanium for permanent anchorage in bone tissue, specifically permanent anchorage of artificial teeth and tooth bridges in the jaw bone. The tip of the anchoring member comprises at least one cavity. The edges of the cavities on the outer cylindrical surface are forming cutting edges to provide self-tapping when the anchoring member is screwed into the bone tissue. The total volume of the cavities is adapted to contain the scraped-off bone tissue material, i.e. the bone tissue material is contained within the volume formed by said cavities.

An anchoring member of this type, a so-called fixture, is previously known by EP 0 237 505. In this case the cavities are formed by two perpendicular through holes which are perpendicular to the longitudinal axis of the fixture or by three not through-going cavities formed on the outer, circular surface of the anchoring member so that cutting edges having a positive cutting angle are formed.

The advantage of a self-tapping fixture is the fact that the fixture can be more easily installed in the jaw-bone. In the normal procedure for installing a fixture a hole is drilled in the jaw-bone. Then drills with successively increasing drilling diameters are used until the hole diameter corresponds to the root diameter of the threaded fixture. In the normal surgical method indicated by Dr Brånemark a screw tap is used to form the internal thread into which the threaded part of the fixture is inserted. When using a self-tapping fixture of the above-mentioned type the installation can be carried out without any screw tap.

The hardness of the bone (jaw-bone) into which the fixtures are installed varies to a big extent. Some of the patients has a very thin outer bone layer, corticalis, which is hard, but the rest of the bone, the inner spongious bone, is very soft. For some patients on the other hand all the bone through the entire section is hard.

Self-tapping fixtures have previously been used primarily for softer bone-types, i.e. bone in the overdenture. Self-tapping fixtures for harder bone types must have very good cutting characteristics in order to limit the torsional force so that the fixture itself or the surrounding bone tissue will not be damaged. Very hard requirements on the fixture design as well as on the cutting sharpness then must be fulfilled.

In another and more simple method for using a self-tapping fixture the hole in the jaw bone is drilled big enough to allow only the outer part of the threading to contact the bone. This is a risky method, however, as the initial stability of the fixture in the bone is reduced.

The object of the present invention is to provide a self-tapping anchoring member (fixture) with good properties even when installed in hard bone qualities. According to the invention the good properties have been achieved by providing the anchoring member with a clearance behind the cutting edges, i.e. the outer surface of the anchoring member, seen in a section through the cutting part of the anchoring member, is slightly bevelled behind each cutting edge. By means of such clearance surface the squeezing effect on the anchoring member in the cutting zone when screwed into the bone can be eliminated. This squeezing effect otherwise contributes to a big extent to the torque transmitted to the anchoring member when installed in the bone.

In a preferred embodiment of the invention the clearance is made as a plane surface but it can also be curved.

In the following the invention will be described more in detail in connection with the accompanying drawing in which Fig. 1 is a side view of the threaded part of the anchoring member and Fig. 2 a section through the cuting part of the anchoring member.

As illustrated in figure 1 the anchoring member comprises a cylindrical screw 1 (fixture) with an external thread 2. The screw is intended to be inserted in a bored hole in the jaw bone for permanent anchoring of artificial teeth and tooth-bridges. The neck portion of the screw is therefore intended to be attached with a spacer element, coupling element or the like. These elements take no part of this invention, however, and are therefore not described in any detail here. The anchoring member is preferably made of commercially pure titanium with a surface structure according to SE-PS 7902035-0.

The screw has a conical, downwardly tapered part 3 to facilitate the insertion of the screw into the bored hole in the bone tissue. The cone angle at the tip of the fixture is a parameter which effects the cutting properties. A small cone angle at the tip of the fixture has a positive effect with respect to the guiding and engagement of the screw thread into the threaded bore hole, but it has also a negative effect as an essential part of the important load carrying threaded surface then is removed. In the present embodiment the cone angle is in the interval of 15°-40°.

The base of the screw is provided with three openings 4 on the cylindrical surface of the screw. The edges 5 of the openings on the cylindrical surface are forming sharp cutting edges and the totale volume of the openings is big enough to room the scraped-off bone tissue material.

The openings 4 are longitudinal and are extending in the longitudinal direction of the screw close to the end surface 6 of the screw. In this way all scraped-off bone tissue material is collected within the cavities and is stored there and the fixture has a plane, unbroken circular bottom surface 6 without any openings. As illustrated in EP 0 237 505 this is an advantage as the collected bone tissue material promotes newly formed bone tissue to grow into the holes and further prevents any tendencies of screwing out the screw after insertion.

The cutting edge 5 comprises a long, straight edge parallel to the longitudinal axis of the screw. In order to obtain a stable insertion of the screw at least three cutting edges are required, which edges are symmetrically arranged about the periphery of the cylindrical surface of the screw.

Figure 2 is a sectional view of the screw which shows the form of the three cavities 4. Each cavity 4 is formed by two perpendicular surfaces, a straight, plane surface 7 with a cutting edge 5 and a concave surface 8. As in EP 0 237 505 the cavities are formed so as to provide a positive cutting edge. In order to reduce the cutting forces when installing the fixture, it is important that the cutting angle of the fixture is as large as possible. In contrast to the previously known fixture the present fixture has an additional clearance 9 behind the cutting edge, i.e. the outer surface behind the cutting edge 5 is slightly bevelled. This means that the distance from the center of the implant screw to the periphery of the screw in the cutting zone has its maximum through the cutting edge part 5.

This means that any squeezing effect which might occur when the fixture is screwed into the bone hole can be avoided. Such a squeezing effect could otherwise be an essential contribution to the torsional moment required for installing the screw.

The additional clearance 9 might have different geometrical designs. It might consist of a straight as well as a curved surface. In the example illustrated in the figures the clearance consists of a straight surface located a short distance behind the cutting edge 5 and is extending to the concave surface 8 in the cavity.

The cutting process can be divided into two stages, the starting process when the fixture is engaged and the rest of the process when the fixture is screwed down into the bone. By means of the clearance 9 and the positive cutting angles on the cutting edge sufficient good start and cutting characteristics for the fixture even for comparatively hard bone qualities can be achieved.

The invention is not limited to the illustrated embodiment but can be varied within the scope of the accompanying claims.

Claims

1. Screw-shaped titanium anchoring member for permanent anchorage in bone tissue specifically permanent anchorage of artificial teeth or tooth bridges in the jaw-bone, comprising at least one cavity (4) on the tip of the screw, the edges of said cavities on the outer cylindrical surface forming cutting edges (5) to provide self-tapping when the anchoring member is screwed into the bone tissue and the total volume of the cavities adapted to contain the scraped-off bone tissue material **characterized** in that the anchoring member behind its cutting edges (5) is provided with a clearance surface (9), i.e. the outer surface of the anchoring member, seen in a section through the cutting part of the anchoring member, is slightly bevelled behind each cutting edge.

2. Anchoring member according to claim 1 **characterized** in that the clearance surface (9) is a plane surface.

3. Anchoring member according to claim 1 **characterized** in that the clearance surface (9) is a curved surface.

4. Anchoring member according to claim 1 **characterized** by a conical tip having a cone angle of 15°-40°, said cavities (4) as well as the clearance surfaces (9) extending down into the conical part.

5. Anchoring member according to claim 4 **characterized** in that the thread diameter of the non-cutting portion of the screw is less than the thread diameter of the cutting portion of the screw.

6. Anchoring member according to claim 1 **characterized** by three cutting edges (5) and clearance surfaces (9) symmetrically distributed about the periphery of the cylindrical surface of the anchoring member.

Fig.1

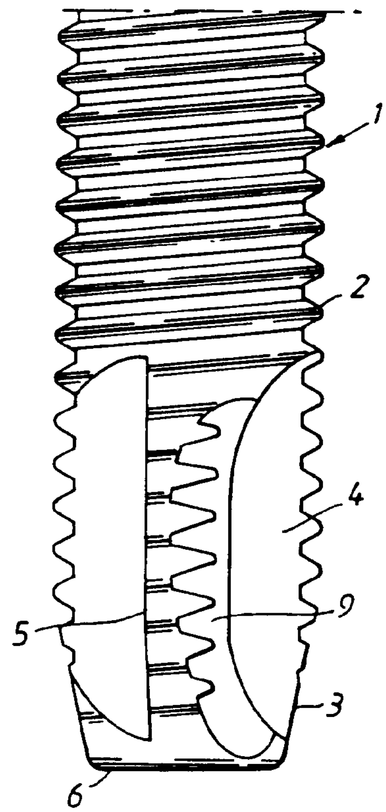
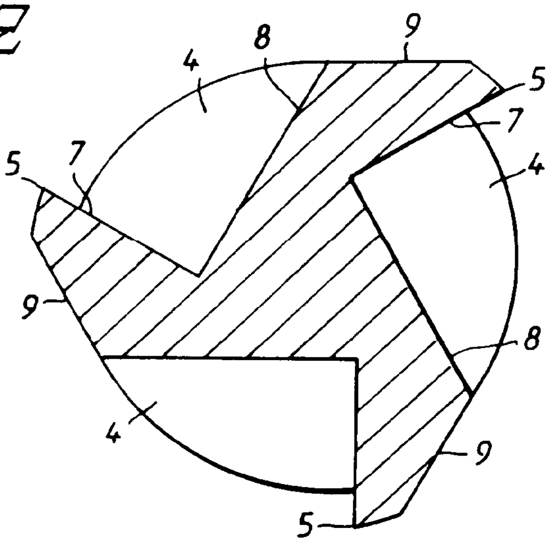


Fig.2



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EUROPEAN SEARCH REPORT

Application Number

EP 92 85 0168

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,A	EP-A-0 237 505 (NOBELPHARMA) * page 7, line 1 - page 8, line 12; figures 3,4 *	1,4,6	A61C8/00
A	EP-A-0 323 559 (MONDANI) * claims 1,3; figures 1,2 *	1	
A	DE-U-9 002 823 (NOBELPHARMA) * page 4, paragraph 2 - page 5, paragraph 1; figures 1,2 *	1,6	
P,A	EP-A-0 458 258 (IMPLADRILL) * abstract; figures 1-9 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A61C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 NOVEMBER 1992	KOUSOURETAS I.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P0401)